Eldrin A. Trapa BSIT 3-B IT-IMDBSYS32(1:30-4:00) MW

Stored Procedures

Question 1: What is a Stored Procedure?
Explain what a stored procedure is and why it is useful in database management. Provide an example of a scenario where a stored procedure would be beneficial.

- A stored procedure is a precompiled collection of SQL statements and procedural logic stored in a database that can be executed as a single unit. It allows users to encapsulate complex queries, business logic, and repetitive tasks, improving performance and security while reducing redundancy. Stored procedures are particularly useful in database management because they enhance efficiency by reducing network traffic, as multiple SQL statements are executed on the database server rather than being sent individually from the application.

  For example, a stored procedure could handle deducting inventory, recording the order details, updating the customer's purchase history, and sending a confirmation email—all in a single transaction, ensuring consistency and reliability.

Question 2: How Do Stored Procedures Improve Performance?
Describe how stored procedures can improve the performance of database operations. Include an explanation of precompilation and reduced network traffic in your answer.

- Stored procedures improve the performance of database operations in several ways. One key advantage is precompilation, where the SQL statements within the procedure are parsed, optimized, and stored in a compiled form, allowing them to execute faster when called. This reduces the need for repeated query parsing and optimization, saving processing time.

  Stored procedures help reduce network traffic because multiple SQL statements are executed on the database server as a single batch rather than being sent individually from an application. This minimizes the back-and-forth communication between the application and the database, leading to faster execution times.

Question 3: Explain Input and Output Parameters in Stored Procedures
What are input and output parameters in stored procedures? How are they used? Provide an example of a stored procedure that uses both input and output parameters.

Input and output parameters in stored procedures allow for dynamic data processing and result retrieval. An input parameter is used to pass values into a stored procedure, enabling it to execute operations based on user-provided data. In contrast, an output parameter returns a value from the procedure to the calling program, making it useful for retrieving computed results or status messages.

For example, in a student management system, a stored procedure could accept a student's ID as an input parameter and return their full name as an output parameter.

Question 4: How Can Stored Procedures Enhance Security
Discuss how stored procedures can enhance database security. Include an explanation of how they help prevent SQL injection attacks.

- Stored procedures enhance database security by controlling access to sensitive data and reducing the risk of SQL injection attacks. Since stored procedures execute predefined SQL statements, users can be granted permission to execute them without needing direct access to the underlying tables, thereby limiting exposure to critical data.

  Stored procedures help prevent SQL injection by using parameterized queries, which separate SQL logic from user input. Unlike dynamic SQL queries that concatenate user input directly into statements making them vulnerable to malicious code injection stored procedures treat input as a parameter rather than executable code. This prevents attackers from injecting harmful SQL commands.

Question 5: Debugging and Maintaining Stored Procedures
What are some best practices for debugging and maintaining stored procedures? Why is it important to document stored procedures?

- Debugging and maintaining stored procedures require best practices such as using meaningful names for procedures and parameters, implementing proper error handling with blocks, and testing procedures with different inputs to ensure accuracy.

  Maintaining stored procedures involves regularly reviewing and optimizing SQL queries, indexing relevant columns, and avoiding unnecessary complexity to improve performance. Proper documentation of stored procedures is crucial because it helps developers understand their purpose, functionality, and dependencies, making future modifications and troubleshooting easier.

SQL Views

Question 1: Purpose of Views

Explain the purpose of SQL views in a database system. How do they differ from physical tables? Provide an example of a scenario where a view would be useful.

- SQL views serve as virtual tables that provide a customized representation of data from one or more physical tables without storing the data themselves. They are used to simplify complex queries, enhance security by restricting access to specific columns or rows, and improve maintainability by allowing changes to be made in one place rather than multiple queries. Unlike physical tables, views do not store data permanently; instead, they dynamically retrieve data from the underlying tables when queried.

  For example, in a university database, an administrator may need a list of active students with their names and courses but should not access sensitive information like financial records. A view can be created to present only the relevant student details, ensuring data security while simplifying queries for end users.

Question 2: Simplifying Queries

Suppose you have a complex query that joins multiple tables and applies filters. How can a view simplify this process? Write a paragraph explaining the benefits of encapsulating such a query in a view

- Encapsulating a complex query that joins multiple tables and applies filters into a view simplifies database operations by providing a reusable, structured representation of the data. Instead of writing lengthy and intricate SQL queries repeatedly, users can retrieve the required data by querying the view, making queries more readable and maintainable. Views also improve consistency by ensuring that all users access the same predefined dataset, reducing the risk of errors due to variations in manually written queries.

Question 3: Data Security

How can SQL views be used to enhance data security? Provide an example of a situation where a view restricts access to sensitive data, such as employee salaries.

- SQL views enhance data security by restricting access to sensitive information while allowing users to retrieve necessary data. By defining a view, database administrators can control which columns or rows are exposed, preventing unauthorized users from accessing confidential details. Views can also be used with role-based permissions, ensuring that only specific users can execute certain queries.

  For example, in a company's payroll system, an HR representative may need to access employee names and departments but should not see salary details. A view can be created to display only the **employee_id, name,** and **department** columns while hiding the **salary** column.

Question 4: Real-World Application

Imagine you are designing a database for a university. Describe a scenario where a view would be helpful for students, faculty, or administrators. What data would the view include, and why would it be beneficial?

- A view named Active Enrollment could be created to provide a summary of currently enrolled students, including their **student_id, name, course, year_level,** and **status.** This view would filter out inactive or graduated students, ensuring that administrators only see relevant data without having to construct complex queries each time. This would streamline tasks such as generating reports, verifying enrollment status, and assisting students with academic concerns. Similarly, a view could be created for faculty members to access their assigned course schedules without exposing confidential student information, ensuring data privacy and efficiency. By using views, the university can simplify data retrieval, enforce access control, and improve overall system usability for different users.